
Name of Organization: University of MI

Type of Organization: College or University

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Project Title: Source Apportionment of Atmospheric Mercury in Michigan

Project Category: Pollution Prevention and Reduction - BNS

Rank by Organization (if applicable): 0

Total Funding Requested (\$): 172,020 **Project Duration:** 2 Years

Abstract:

According to the 1998 USEPA Mercury Study Report to Congress, the majority of anthropogenic mercury emissions to the atmosphere in the U.S. are a result of fossil fuel combustion and waste incineration. This report also identified there to be a high density of coal combustion and waste incineration in southeast lower Michigan. Recently published studies in Chicago and South Florida have indicated that as much as 70% of the mercury deposited to sensitive ecosystems (Lake Michigan and the Florida Everglades, respectively) can be accounted for by nearby local anthropogenic point source emissions. Although atmospheric mercury data has previously been collected in Michigan, this monitoring has been limited mainly to rural areas since the purpose has been to quantify mercury deposition, not identify the sources of the atmospheric mercury. An effort to quantitatively identify the sources of atmospheric mercury deposited to Lakes Erie, Huron, and St. Clair, and the likely contributions from sources within southeast Michigan has not been undertaken to date. This project proposes the collection and analysis for ambient trace elements coincident with collection and analysis of ambient mercury currently planned under a proposed project submitted to the Michigan Great Lakes Protection Fund. Combined with the daily event collection and analysis of mercury and other trace elements in precipitation at 6 monitoring sites, this project will provide a robust data-set to be used in support of future mercury source identification and apportionment efforts as they apply to atmospheric mercury deposited to Lakes Erie, Huron, and St. Clair. This will also provide a data-set for an assessment of mercury emissions from local southeast Michigan point sources in relation to contributions from more regional sources transported from the greater midwest U.S.

Geographic Areas Affected by the Project

States:

<input type="checkbox"/> Illinois	<input type="checkbox"/> New York
<input type="checkbox"/> Indiana	<input type="checkbox"/> Pennsylvania
<input checked="" type="checkbox"/> Michigan	<input type="checkbox"/> Wisconsin
<input type="checkbox"/> Minnesota	<input type="checkbox"/> Ohio

Lakes:

<input checked="" type="checkbox"/> Superior	<input checked="" type="checkbox"/> Erie
<input checked="" type="checkbox"/> Huron	<input type="checkbox"/> Ontario
<input type="checkbox"/> Michigan	<input type="checkbox"/> All Lakes

Geographic Initiatives:

<input type="checkbox"/> Greater Chicago	<input type="checkbox"/> NE Ohio	<input type="checkbox"/> NW Indiana	<input checked="" type="checkbox"/> SE Michigan	<input type="checkbox"/> Lake St. Clair
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Primary Affected Area of Concern: Not Applicable

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

Mercury is a pollutant of considerable concern in aquatic ecosystems due to its strong tendency to bioaccumulate up the food chain and its demonstrated link to human health effects. Since 1988, the Michigan Department of Community Health has issued a state-wide fish consumption advisory for mercury for all of Michigan's inland lakes, the Great Lakes and Lake St. Clair. The atmosphere has been determined to be a major pathway for the transport and deposition of mercury to the Great Lakes. Less certain, however, is the source of this atmospheric mercury that is deposited.

According to the 1998 USEPA Mercury Study Report to Congress, the majority of anthropogenic mercury emissions to the atmosphere in the U.S. are a result of fossil fuel combustion and waste incineration. This report also identified there to be a high density of coal combustion and waste incineration in southeast lower Michigan. Recently published studies in Chicago and South Florida have indicated that as much as 70% of the mercury deposited to sensitive ecosystems (Lake Michigan and the Florida Everglades, respectively) can be accounted for by nearby local anthropogenic point source emissions. Although atmospheric mercury data has previously been collected in Michigan, this monitoring has been limited mainly to rural areas since the purpose has been to quantify mercury deposition, not identify the sources of the atmospheric mercury.

An effort to quantitatively identify the sources of atmospheric mercury deposited to Lakes Erie, Huron, and St. Clair, and the likely contributions from sources within southeast Michigan has not been undertaken to date.

Proposed Work Outcome:

As part of a project proposal titled "DEVELOPMENT OF A MICHIGAN ATMOSPHERIC MERCURY MONITORING NETWORK" submitted to the Michigan Great Lakes Protection Fund by the University of Michigan and the Michigan Department of Environmental Quality, a network of six monitoring locations will be established in Michigan, with a high density of locations in southeast Michigan. As part of this project, daily-event precipitation samples will be collected concurrently at all six monitoring sites for a total period of three years, beginning in January, 2001. In addition to mercury, these samples will be analyzed for a suite of additional trace elements. At two of the six monitoring sites, seasonal intensive field studies (four per year) will be conducted. These seasonal intensive periods will include daily speciated measurements of ambient mercury in both the gaseous (incl. reactive gaseous mercury, RGM) and particulate phase. Because of its high water solubility, RGM along with particulate mercury make up the critical components of atmospheric mercury which are available to be deposited.

The current project proposes to supplement these ambient mercury measurements with measurements of a suite of 20+ additional ambient trace elements (i.e. Se, Zn, Cl, Pb, Cd, As, etc.). This would include daily particulate sample collection onto 47mm Teflon filters during these seasonal intensive field studies. The filters would then undergo elemental analysis using x-ray fluorescence (XRF) and inductively coupled plasma-mass spectroscopy (ICP-MS). Due to the 2-year

project duration limit of this funding program, the current project would collect and analyze filters for the first 6 seasonal intensive periods (first 18 months of data collection). It is anticipated that additional funds will be sought through other funding programs for the final 6 intensive periods (last 18 months of data collection).

Since many sources emit trace elements that are characteristic to their specific source type, relationships may be established by linking emissions with receptor conditions through specific source "fingerprints" or tracers of opportunity. By quantifying the relationship between specific elements or ratios of elements and elevated levels of mercury, source-receptor relationships for mercury may be established. These relationships allow a quantitative source apportionment of atmospheric mercury to be performed.

The collection and analysis for ambient trace elements coincident with collection and analysis of ambient mercury, combined with the daily event collection and analysis of mercury and other trace elements in precipitation, provides a robust data-set to be used in support of future mercury source apportionment efforts as they apply to mercury deposited to Lakes Erie, Huron, and St. Clair. This will also provide a data-set for an assessment of mercury emissions from local southeast Michigan point sources in relation to contributions from more regional sources transported from the greater midwest U.S. As reflected in the attached project budget, all funds will be used for the sole purpose of purchasing air sampling equipment and supplies needed for installation of sampling equipment, sample collection, sample analysis, and generation of project data report.

Project Milestones:

Dates:

Project Start	10/2000
Purchase Sampling Equipment	10/2000
Install Field Equipment/Start Sampling	01/2001
Start Filter Analysis	03/2001
Year 1 Annual Report	10/2001
End Sample Collection	06/2001
Submit Final Data Report	09/2002
Project End	09/2002

☒ Project Addresses Environmental Justice

If So, Description of How:

Levels of atmospheric mercury in Michigan to date have mainly been investigated in rural areas. This project is directly aimed at assessing the levels and sources of mercury in urban areas. This will be accomplished by establishing monitoring locations within the urban areas. The majority of suspected large point sources of mercury to the atmosphere are located in these areas of low income and African-American populations.

☐ Project Addresses Education/Outreach

If So, Description of How:

Project Budget:

	Federal Share Requested (\$)	Applicant's Share (\$)
Personnel:	33,788	10,076
Fringe:	10,812	3,224
Travel:	1,500	0
Equipment:	10,000	0
Supplies:	9,900	0
Contracts:	0	0
Construction:	0	0
Other:	50,592	0
Total Direct Costs:	116,592	13,300
Indirect Costs:	55,428	0
Total:	172,020	13,300
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

Michigan Great Lakes Protection Fund, \$2.39 million: A multi-year project titled "DEVELOPMENT OF A MICHIGAN ATMOSPHERIC MERCURY MONITORING NETWORK", has been submitted to the Michigan Great Lakes Protection Fund with a total budget of \$2.39 million.

Description of Collaboration/Community Based Support:

A multi-year project titled "DEVELOPMENT OF A MICHIGAN ATMOSPHERIC MERCURY MONITORING NETWORK", has been submitted to the Michigan Great Lakes Protection Fund. As part of this project, the University of Michigan will collaborate with the Air Quality division of the Michigan Department of Environmental Quality. This collaboration will continue for the current proposed project.